

MORSE (J. L.)

al

[Reprinted from the Boston Medical and Surgical Journal
of June 4, 1896.]

THE HOME MODIFICATION OF MILK.

BY JOHN LOVETT MORSE, A.M., M.D.,

*Physician to Out-Patients at the Boston City Hospital and at the West
End Nursery and Infants' Hospital.*

WE are justified, I think, in advancing the following propositions concerning the nourishment of infants. The best food for an infant is human breast-milk. Any substitute for this should be like it. That substitute is best which is most like it. This substitute must be composed of some substance which can be easily obtained and which can be easily prepared. The substance which best fulfils these requirements is cow's milk. Cow's milk can be best converted into a substitute food in laboratories established for this purpose. Where these are not available it can be satisfactorily, accurately and scientifically prepared at home. Every one will, I think, admit the truth of all these propositions except the last. Many will object to this, I feel sure. It will be said that the process is too complicated, that it takes too much time, that it requires more intelligence than the average woman possesses, that it is too expensive, and that for these reasons people cannot be induced to employ it. It is my purpose to attempt to answer these objections and to demonstrate the truth of this last proposition.

Before doing this, however, I wish to state some other propositions which may be regarded as corollaries of those just presented. Any substitute for human breast-milk which is not like it is not fit for use. Any food which contains substances not normally found in

{ presented by
the author



human breast-milk (as starch or cane-sugar), which is not fresh, or which is not comparatively free from bacteria, is unfit for use. Any food which, although containing the proper constituents, contains them in improper proportions is unsuitable. As all proprietary and patent foods are open to one or more of these objections, they should not be used in the substitute feeding of infants.

There is nothing new or original in the method of modifying milk which I am in the habit of using. It is that which has been developed and perfected by Dr. Rotch, and consists in separating cow's milk into cream and milk and recombining them in different proportions with the addition of water, lime-water and milk-sugar to imitate human milk. It was impossible to do this accurately until the Walker-Gordon Laboratory supplied us with accurate formulæ for preparing the various modifications. Dr. Rotch has given a very complete list of those which are ordinarily used in the feeding of normal infants in his recent work on "Pediatrics" (page 279), and I have always found the laboratory very willing to give me the proportions needed for the preparation of any special formulæ which I have desired.

The apparatus needed for the preparation of the milk is as follows:

Two or three glass jars to set the milk in. Mason's fruit-jars are perfectly satisfactory and are found in every family.

Bottles to hold the milk. These can be purchased at the laboratory for ten cents each or a dollar a dozen. These are the best, but any bottles which are smooth inside will do.

Siphon. A piece of glass tube suitable for this purpose can be bought for eight cents, and bent at home.

Thermometer. A thoroughly reliable thermometer can be purchased at the laboratory for fifty cents. Cheaper ones can be obtained for twenty-five cents, but are not trustworthy.

Graduate measuring ounces. The best eight-ounce graduate costs seventy-five cents, but a satisfactory four-ounce graduate can be bought at the department stores for nineteen cents. "A family measuring-glass," made by Silver & Co. of New York, which will answer every purpose, can also be obtained at any of the department stores for ten cents.

Cotton stoppers. Ordinary cotton-wadding at thirteen cents a roll is perfectly satisfactory for this purpose.

This is all the apparatus that is necessary. If desired, a rack to support the bottles while the milk is being Pasteurized may be made at home from a sheet of tin with holes cut in it. The first cost for apparatus thus amounts to —

Bottles, one dozen,	\$1.00
Glass tube for siphon	.08
Thermometer	.50
Family measuring-glass	.10
Cotton for stoppers	.13
	\$1.81

This certainly does not seem exorbitant.

The materials used in the preparation of the food are milk, milk-sugar and lime-water. The price of milk varies, of course, in different localities, but good milk may be obtained here for seven cents a quart. The diet kitchens will furnish it for five cents a quart on a physician's order. Druggists and grocers sell milk-sugar at prices varying from thirty to sixty cents a pound. The laboratory will furnish the best quality for forty cents a pound, and will make a discount on large amounts. Wholesale druggists will sell twenty-

five pound lots at the rate of nineteen cents a pound. The lime-water can be made at home, and costs practically nothing. The method is as follows: Slake a small piece of quick-lime in a little water. Add to this a gallon of cold water. Shake and let settle. Decant and use clear solution from top. If left for a long time exposed to the air the calcic hydrate may be precipitated as calcic carbonate. No organic change rendering it unfit for use can take place, however.

I always give the following written directions:

Wash thoroughly and boil the glass-jars, bottles, measuring-glass and siphon every day before using. As soon as the milk comes, put it in the jars, cover with a clean cloth and set in a cool place for six hours. I find that it is usually most convenient for working-people to set the milk in the morning and prepare the food in the afternoon. At the expiration of this time siphon off the lower three-quarters of the milk into a clean, boiled glass jar. Start the siphon with boiled water. It may be stated here parenthetically that the upper one-quarter has been found to be ten per cent. cream. Then mix in the following proportions in a clean dish which has been previously boiled.

Upper one-quarter	.	.	.	.	.	.	.
Lower three-quarters	.	.	.	.	.	.	.
Lime-water	.	.	.	.	.	.	.
Boiled water (not boiling)	.	.	.	.	.	.	.
Sugar of milk	.	.	.	.	.	.	.

These proportions, of course, vary.

Then put x ounces of this mixture in each of y bottles, and stopper tightly with cotton. Place these bottles upright in a dish of water, the water in the dish being at the level of the milk in the bottles. Put the dish on the stove and heat until the thermometer in the water reaches 170° . Then take it off

A pint of milk will furnish four ounces of "upper quarter." This means seven pints of milk a week, which, at seven cents a quart, amounts to twenty-five cents. Six ounces of milk-sugar will be required per week. This, at forty cents a pound, costs fifteen cents. One cent a week for lime-water and three cents for cotton are liberal estimates. The cost per week, then, of the milk for a two weeks' old baby is forty-four cents. This is certainly not excessive. The skim-milk is also available for use in other ways.

A three months' old baby will need about seven feedings of four ounces each of a milk containing fat 3.00, sugar 6.00, albuminoids 1.00. The formula for this mixture of an alkalinity of five per cent. is as follows:

Upper one-quarter	8 ounces
Lime-water	1½ ounces
Water	18½ ounces
Milk-sugar	1½ ounces

This mixture requires one quart of milk a day, which will cost forty-nine cents a week, while the milk-sugar will cost thirty-one cents a week. The lime-water and cotton, may, as before, be estimated at four cents a week. This amounts to eighty-four cents a week.

An eight months' old infant will, as a rule, take eight ounces of a milk of this formula:—fat 4.00, sugar 7.00, albuminoids 2.50, six times a day. The formula for this mixture, of an alkalinity of five per cent., is as follows:

Upper one-quarter	19 ounces
Lower three-quarters	12 ounces
Lime-water	2½ ounces
Water	14½ ounces
Milk-sugar	2½ ounces

This requires five pints of milk a day, costing \$1.23 per week. The milk-sugar will cost forty-five cents,

and the lime-water and cotton four cents more. This makes a total of \$1.72 a week. This is the most expensive mixture, and represents the maximum cost. These figures can be still further reduced if the milk-sugar is bought at wholesale. In this case the cost of this last mixture would be reduced to \$1.50 a week. In the country where milk is cheaper, or when the milk is purchased at a diet kitchen, the expense may be made still less.

The milk-sugar may be measured by level teaspoons, or by the $3\frac{3}{8}$ drachm measure which may be obtained at the laboratory. It is unnecessary, I think, to weigh it.

In the rare instances in which the patients are not sufficiently intelligent — or, what is more common, too lazy — to follow this method, I have them set the milk and then separate it by pouring. I then tell them how to mix the food for each feeding by teaspoons. For example, reckoning six teaspoons to an ounce, four ounces of a milk containing fat 3.00, sugar 6.00, albuminoids 1.00, and of an alkalinity of five per cent., is as follows:

Upper one-quarter		7 $\frac{1}{4}$ teaspoons
Lime-water		1 $\frac{1}{2}$ teaspoons
Boiled water.		15 $\frac{1}{2}$ teaspoons
Milk-sugar		1 $\frac{1}{2}$ teaspoons (level)

This is readily worked out from the formula for the twenty-four hours' amount by dividing it by the number of feedings and multiplying by six. The milk cannot, of course, be as accurately prepared in this way. Moreover, it is not Pasteurized. Hence the method must be regarded merely as an imperfect substitute for that first described. With all its inaccuracies, however, it gives a fairly satisfactory food and one which is susceptible of modification to suit the individual case. It requires but little time, and

is certainly within the mental capacity of every one, however stupid.

If, as sometimes happens, the results of the home modification are not successful it must not be thought that these infants cannot be made to thrive on modified milk. In such cases the milk from the laboratory, where it can be more accurately modified, should be tried until the proper combination is found. The home modification may then be successfully resumed.

In conclusion I can only add that, having employed the home modification of milk in the out-patient departments of the Infants' Hospital and of the City Hospital as well as in private practice for several years, I can testify to the feasibility of the process and the good results obtained from its use.